Appendix E

Selection of Harvest Cutting Methods

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Harvest cutting methods include both even-aged and uneven-aged silvicultural systems (see Figure F-1). Even-aged harvest cutting methods generally include clearcutting, shelterwood cutting and seedtree cutting. Uneven-aged harvest cutting methods generally include individual tree selection and group selection cutting. The intent here is to document the rationale for selection of harvest cutting methods (even-aged or uneven-aged) to be applied on the Forest. The specific harvest treatment methods (such as clearcutting, seedtree cutting or group selection) will be selected on a site specific basis as identified in project level environmental analyses, or in silvicultural prescriptions written or approved by a certified silviculturist. Although even-aged management will generally be favored for reasons given below, this does not preclude the use of some tree or group selection cutting methods where they may be applicable.

Discussion of Even-Aged vs. Uneven-Aged Criteria

The criteria used for determining harvest cutting methods were developed using those identified in the Regional Guide for the Pacific Northwest Region (1984), as well as direction provided in 36 CFR 219.27(b) for management prescriptions that involve manipulation of tree cover. A brief description of the criteria follows. More detailed discussion can be found in the above cited documents.

Regional Guide Criteria

1. The method must permit the production of a volume of marketable trees sufficient to utilize all trees that meet utilization standards and are designated for harvest.

2. The method must permit use of a logging system which can remove designated trees without excessive damage to the residual stand and while meeting other established land management objectives. Table 3-1 in the Regional Guide displays the compatibility of logging systems with common harvest cutting methods. Generally, ground based logging methods, helicopters, and cable methods using slack pulling carriages are appropriate for all harvest methods, while cable methods without slack pulling carriages and balloons are appropriate only for clearcuts.

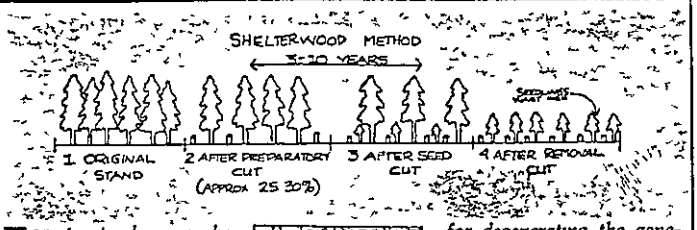
3. The harvest method must be capable of providing special conditions that are required to meet resource management objectives. Table 3-2 in the Regional Guide displays commonly used harvest methods which achieve desired forest character. Generally, both even-aged and uneven-aged methods can meet desired forest character with the exception of a mosaic of forest and opening, and maximum wildlife species diversity. Here, uneven-aged methods are not applicable.

4. The method must permit control of vegetation to establish desired numbers and rates of growth of trees as well as other vegetation needed to achieve special management objectives. Tables 3-3 and 3-4 in the Regional Guide outline these harvest cutting methods. Generally, both even-aged and uneven-aged methods can be used in vegetation zones occurring on the Forest, however uneven-aged methods are not applicable for maximum forage production or optimum tree seedling and sapling growth.

5. The method must promote a stand structure and species composition which minimizes serious risk from insects, disease, animal damage and wildfire, and will allow treatment of exist-

Figure E-1
Four Ways to Grow A Forest

FOUR WAYS TO GROW A FOREST



Forest stands can be harvested to produce a subsequent stand that is either even-aged or uneven-aged. Even-aged stands are ones in which all the trees are relatively close in age uneven-aged stands are comprised of trees that are in two or more age classes To achieve either type of stand certain harvesting methods are generally employed One of three methods can be used to ensure reproduction of an even-aged stand—clearcutting, seed-tree, or shelterwood For an uneven-aged stand, only the selection method can be used Let's examine the advantages and disadvantages of each of these four methods

A selection harvest is the removal of mature timber, usually the oldest or largest trees, as single scattered individuals or in small groups Cutting is done fairly often and is repeated indefinitely to maintain the uneven-aged structure of the stand Advantages of using a selection cut are that the stand is less susceptible to disease insects and fungi that would attack one species or age-class a continuous forest cover helps protect steep slopes from erosion, and such timber cutting is aesthetically most favorable On the other hand the method requires greater skill and more time in marking trees rather than boundaries of a sale area or trees to be left It is also more costly to return to a stand time and time again for a partial harvest and in doing so it is difficult to prevent logging damage to immature trees Perhaps the biggest drawback of the selection method is that of the four methods, it has the greatest potential for degenerating the genetic quality of the stand by eliminating the best trees

With clearcutting, an entire stand is harvested in one cutting and reproduction is obtained either artificially (by planting) or by natural seeding from adjacent stands or trees felled as part of the harvest Clearcutting is less expensive than the selection method, does no damage to the subsequent stand, and takes less time to mark However, there is a greater risk of disease and insect attack to the even-aged stand, a clearcut reduces protection from erosion and flooding, and it results in the least attractive appearance of the forest Most importantly, if reproduction on a clearcut fails, the resource manager may have to resort to planting, which is costly and time consuming

From top, shelterwood, selection, and seed-tree methods are three ways of managing forests

The seed-tree method is similar to the clearcut except that a few of the best trees on each acre are left singly or in groups to provide a seed source for getting the next stand started. Thus it has the benefits of clearcutting along with a better chance for natural seeding A disadvantage is that harvesting the seed trees after they have done their job can damage part of the forest they have helped create And many times the seed trees do not last that long, because they are more subject to the forces of nature when standing alone or nearly so

In a shelterwood cutting there is even greater insurance for reproduction as more trees are left to encourage even-aged regeneration in partial shade of the trees that are left

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From: Boerner, D. 1986, Monongahela Revisited. American Forests, Vol. 92(2) pp. 19, 51.

FOUR WAYS TO GROW A FOREST

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Since there is always vegetation on the site this method approaches a selection cut in appearance and protection against erosion However harvest operations must occur at least twice as often as on a clearcut, and the harvest of overstory trees once the new stand is established can damage the reproduction

The four harvest methods should not be viewed as totally separate techniques The line between a group seed-tree and a shelterwood cut, for example is not distinct Neither is the difference between some shelterwood and selection harvests To stretch the example a bit farther but not out of proportion a clearcut can approximate a shelterwood cutting if it is small enough and/or located so that the adjacent stand encourages certain species to grow in its shade Likewise a large group selection cut in an uneven-aged stand might be considered by some as a clearcut The important thing to note is that these harvest methods are in reality reproduction methods and should be chosen singly or in combination to reproduce a stand with a particular species and age composition according to objectives and environmental/economic circumstances

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ing insect, disease and fuel conditions. Table 3-5 in the Regional Guide displays harvest cutting methods favorable to the reduction and treatment of these agents. Generally, uneven-aged methods are not applicable where dwarf mistletoe and root disease present serious risks.

6. The method must meet multiple use management objectives identified in the Regional Guide and Forest Plan.

36 CFR 219.27(b) Criteria

The seven criteria identified in 36 CFR 219.27(b) which direct management prescriptions for the manipulation of tree cover are summarized as follows:

1. Be best suited to multiple use goals, considering biological, environmental, engineering, economics, and other impacts.
2. Assure that lands can be adequately restocked.
3. Not be chosen primarily because of the greatest dollar return or timber output, although these factors should be considered.
4. Consider the potential impacts on residual trees and adjacent stands.
5. Avoid permanent reduction of site productivity and ensure conservation of water and soil.
6. Provide the desired effects to meet special management objectives.
7. Be practical in terms of transportation and harvesting requirements, and total costs of timber sale preparation, logging, and administration.

Combined Criteria for Harvest Cutting Method

The criteria identified in the Regional Guide and in 36 CFR 219.27(b) were subsequently combined to eliminate duplication of intent and simplify the rationale for selecting the harvest cutting methods used to implement the Forest Plan. The seven criteria combined are summarized as follows:

1. The method must produce a volume of marketable trees that meet utilization standards and are designated for harvest. (Regional Guide: criteria 1.)
2. It must use available and acceptable logging systems. (Regional Guide: criteria 2, 36 CFR 219.27(b): criteria 4.)
3. It must be capable of meeting special management and multiple use objectives. (Regional Guide: criteria 3 and 6; 36 CFR: criteria 1 and 6.)
4. The method must permit control of vegetation to establish desired species composition, density, and rates of growth (Regional Guide: criteria 4; 36 CFR: criteria 4 and 6.)
5. It must promote a stand structure and species composition which minimizes risks from insects, disease and wildfire. (Regional Guide: criteria 5.)
6. The method must assure that lands can be adequately restocked (36 CFR: criteria 2.)
7. It must be practical and economical in terms of transportation, harvesting, preparation and administration of timber sales. (36 CFR: criteria 7.)

Forest Types and Management Areas

Both even-aged and uneven-aged harvest cutting methods are acceptable and were evaluated for selection within the two major Forest types and management areas where timber harvesting is scheduled. Management areas were grouped based on rationale for selecting the harvest system. Groups with similar rationale are summarized as follows:

Management Group		Management Area
General Forest	9	Rock Creek/Cottonwood Creek Unroaded-Helicopter Area
	21	General Forest Winter Range
	22	General Forest
Big Game	20	Big Game Winter Range

Riparian	15	Riparian
Recreation & Others	7	Summit National Historic Trail
	11	Lookout Mountain Recreation Area
	12	Eagle Roosting Areas
	13	Developed Recreation
	14	Dispersed Recreation
	16	Bandit Springs Recreation Area
	17	Stein's Piller Recreation Area
	18	Hammer Creek Wildlife Area
	19	Deep Creek Recreation Area
	23	North Fork Crooked River Recreation Corridor
	24	North Fork Crooked River Scenic Corridor
	27	Round Mountain National Recreation Trail
Visual Corridor	25	Highway 26 Visual Corridor
	26	Visual Management Corridors

Rational for Determining Harvest Cutting Method

The following analysis documents rationale for determining the harvest cutting method within each forest type (ponderosa pine and mixed conifer) and management group[1] based on those combined criteria which have a significant effect on the method selected.

Ponderosa Pine Forest Types

Ponderosa Pine/General Forest

Lands within this management area will be managed for both timber and forage production. Thermal and/or hiding cover for big game will be provided on at least ten percent of the area that is in winter range. Satisfactory tree growth rates should be maintained and stands should be protected from insects, disease and damaging agents. Both even-aged and uneven-aged methods are biologically acceptable (Barrett, 1979, Burns, 1983). Even-aged methods generally provide enhanced forage production and maximize wildlife species diversity (combined criteria 3). Even-aged methods generally provide for enhanced seedling and sapling growth rates because of the significant effect of mature or larger trees on height and diameter growth of the understory (Barrett, 1979) (combined criteria 4). Clearcutting or shelterwood cutting with planting allows the introduction of genetically improved stock. Where dwarf mistletoe and root disease are present, uneven-aged methods are not applicable (combined criteria 5). Even-aged methods are more economical and practical in terms of transportation, harvesting, preparation and administration (Barrett, 1979; Burns, 1983) (combined criteria 7). Uneven-aged stands are generally more aesthetic and are best suited for the production of high quality trees and provide better distribution of snags (combined criteria 3). With uneven-aged systems thrifty (fast growing) black-bark pines and more thrifty old growth can be retained to supply a more continuous supply of large pine. Within this working group, periodic use of prescribed fire reduces fuel accumulations and eliminates undesirable competitive vegetation (Burns, 1983). Even-aged methods are more compatible with this treatment, but with care and proper timing prescribed burning can be done in uneven-aged stands.

It is clear that neither system is universally superior, so the decision needs to be made based on site specific analysis. Generally, an uneven-aged system is the preferred method where: the existing stand is multi-age, tractor logging is planned, and diseases are not a problem. Even-aged systems will be used in most cases where these conditions are not met.

Ponderosa Pine/Big Game

Vegetation will be managed to provide optimum habitat for deer and elk. Special conditions required to meet the resource management objectives include providing thermal cover over 20 percent of the area as well as a vigorous forage base. Prescribed burning is recommended for site preparation and

[1]The management prescriptions contained in Appendix D provide more specific direction

forage enhancement. Although both even-aged and uneven-aged harvest cutting methods are biologically acceptable, even-aged methods can best provide for the special conditions (cover) within this management area (combined criteria 3). Uneven-aged methods are generally not applicable where the desired character is a mosaic of dense forest, 30 to 60 acres in size, and openings of similar size. In addition, the transportation system and entry frequency necessary for management of uneven-aged stands results in more big game harassment.

Ponderosa Pine/Riparian

Vegetation will be managed to provide streambank stability, stream shading, and a supply of large woody debris. Timber production and economic returns is a secondary consideration. Both even-aged and uneven-aged methods can provide these conditions (combined criteria 3). Either harvesting method may be used based on specific site and stand characteristics, as documented in the project level environmental analysis.

Ponderosa Pine/Recreation and Other

Ponderosa pine managed in these areas will maintain visual diversity through variations of stand densities and size classes. Large, old growth trees will provide an important stand component. Both even-aged and uneven-aged methods are biologically appropriate and can provide for the visual variety and maintenance of a large tree component. Here, the special conditions required to meet management objectives take precedence over economic considerations or timber volume production (combined criteria 3). Tree growth rates should be sufficient to produce the characteristic large tree component within the rotation age and maintain trees in a healthy condition (combined criteria 4). In addition, trees should be managed to minimize risks from insects, disease and wildfire (combined criteria 5). Either even-aged or uneven-aged harvest cutting methods may be selected here. The ultimate selection should be based on specific site and stand characteristics as documented in project level environmental analyses.

Ponderosa Pine/Visual Corridors

Management requirements are similar to Developed Recreation but with more emphasis on open park-like stands of ponderosa pine. Either even-aged or uneven-aged management could be used but even-aged management with extended rotations can best meet the size requirements (combined criteria 4) and the park-like condition (combined criteria 3).

Mixed Conifer Forest Types

Mixed Conifer/General Forest

Lands within this management area will be managed for both timber and forage production. Thermal cover for big game will be provided on at least ten percent of the area that is in winter range. Satisfactory growth rates should be maintained and stands should be protected from insects, disease and damaging agents. Species composition in this working group should be controlled to produce trees which can maintain satisfactory growth rates and resistance to insects, disease and damage (Schmitt, 1984). Both even-aged and uneven-aged methods are biologically acceptable here. The selection decision is weighted heavily by successional trends and upon the relative shade tolerance of species present within the mixed conifer working group (Burns, 1983; Minore, 1979). Here, shade intolerant species, including ponderosa pine and western larch, are more desirable and better meet management objectives for growth and resistance to insects, disease, and damage. Even-aged management is most desirable to convert over-mature, old growth stands to vigorous stands of shade intolerant species (Burns, 1983) (combined criteria 4 and 5). Also, on the Ochoco National Forest, mixed conifer stands frequently occur on slopes greater than 30 percent where acceptable logging systems and fuels treatment favor even-aged methods (combined criteria 2). These methods are generally more practical and economical in terms of transportation, harvesting, preparation and administration of timber sales (combined criteria 7). Even-aged methods will generally be selected for mixed conifer/timber, but uneven-aged may be used where thrifty, disease free, multi-age stands occur with acceptable species mix.

Mixed Conifer/Big Game

The objective in this management area is to maintain 40 percent cover in stands 30 to 60 acres in size. This can be met with minor modifications to the Timber-Range prescription (see the Forest Plan, Management Prescriptions). Even-aged management is the only system that will provide the cover requirements in the size of area needed to meet the management objectives. Even-aged is selected for this reason (combined criteria 3). Other reasons as discussed in Timber-Range above also apply.

Mixed Conifer/Riparian

Vegetation here will be managed to provide streambank stability, stream shading, and a supply of large woody debris. Timber production and economic returns are secondary considerations. Both even-aged and uneven-aged methods can provide these conditions (combined criteria 3). Either harvesting method may be used based on specific site and stand characteristics as documented in project level environmental analyses. When uneven-aged is selected, it will be by group selection method rather individual selection.

Mixed Conifer/Recreation and Other, and Visual Corridors

Mixed conifer stands managed in this area will provide a variety of species, snags and size classes. Large, old-growth trees will provide an important stand component. Both even-aged and uneven-aged harvest cutting methods are biologically applicable and can provide for the visual variety and maintenance of the large tree component. Here, the special conditions required to meet visual management objectives are the primary consideration (combined criteria 3). While economic returns and timber volume production are also important, they play a secondary role in this management area. Tree growth rates should be sufficient to produce the characteristic large tree component and maintain trees in a healthy condition (combined criteria 4). In addition, trees should be managed to minimize risks from insects, disease and wildfire (combined criteria 5). Either even-aged or uneven-aged methods may be selected here. Uneven-aged methods may require artificial regeneration to maintain the appropriate species composition and may be restricted to sites where acceptable logging methods can be applied (combined criteria 2). Uneven-aged methods are not applicable where insect or disease conditions cannot maintain stands relatively free of risk (combined criteria 5). Where even-aged management is used it will use small patch cuts, and where uneven-aged management is used it will be group selection. The ultimate selection should be based on specific stand and site characteristics as documented in project level environmental analyses.

Literature Cited or Reviewed

The evaluation of harvest cutting methods is based on operational experience and research findings published in the following documents:

Barrett, J.W. 1979. Silviculture of Ponderosa Pine in the Pacific Northwest: the State of Our Knowledge. USDA For. Serv. Gen. Tech. Rpt. PNW-92, PNW For. and Range Exp. Stn., Portland, Or. 106 p.

Burns, R.M, tech. comp. 1983. Silvicultural Systems for the Major Forest Types of the United States. Ag. Handb. 445, USDA, Washington, D.C. 191 p.

Fowells, H.A., tech. comp. 1965. Silvics of Forest Trees of the United States. Ag. Handb. 271, USDA, Washington, D.C 762 p.

Minore, D. 1979. Comparative Autecological Characteristics of Northwestern Tree Species: A Literature Review. USDA For. Serv. Gen. Tech. Rpt. PNW-87, PNW For. and Range Exp. Stn., Portland, Or. 72 p.

Schmidt, C.L, et al 1984. Effects of Management Activities, and Dominant Species on Pest-Caused Mortality Losses in True Fir on the Fremont and Ochoco National Forests. USDA Pacific Northwest Region, Forest Service. Portland, Or.

Smith, D. 1962. The Practice of Silviculture. John Wiley & Sons, Inc. New York. 578 p.